Ecological Intensification
Agriculture, environment, nature and societies

On-going reflection:
towards a CIRAD research platform in East Africa ?

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08/07/2010

présenté aux CGIAR en place au Kenya, Zimbabwe et Ouganda ainsi qu'aux centres de recherche agronomique régionaux, Juin 2010

Challenges in agriculture…

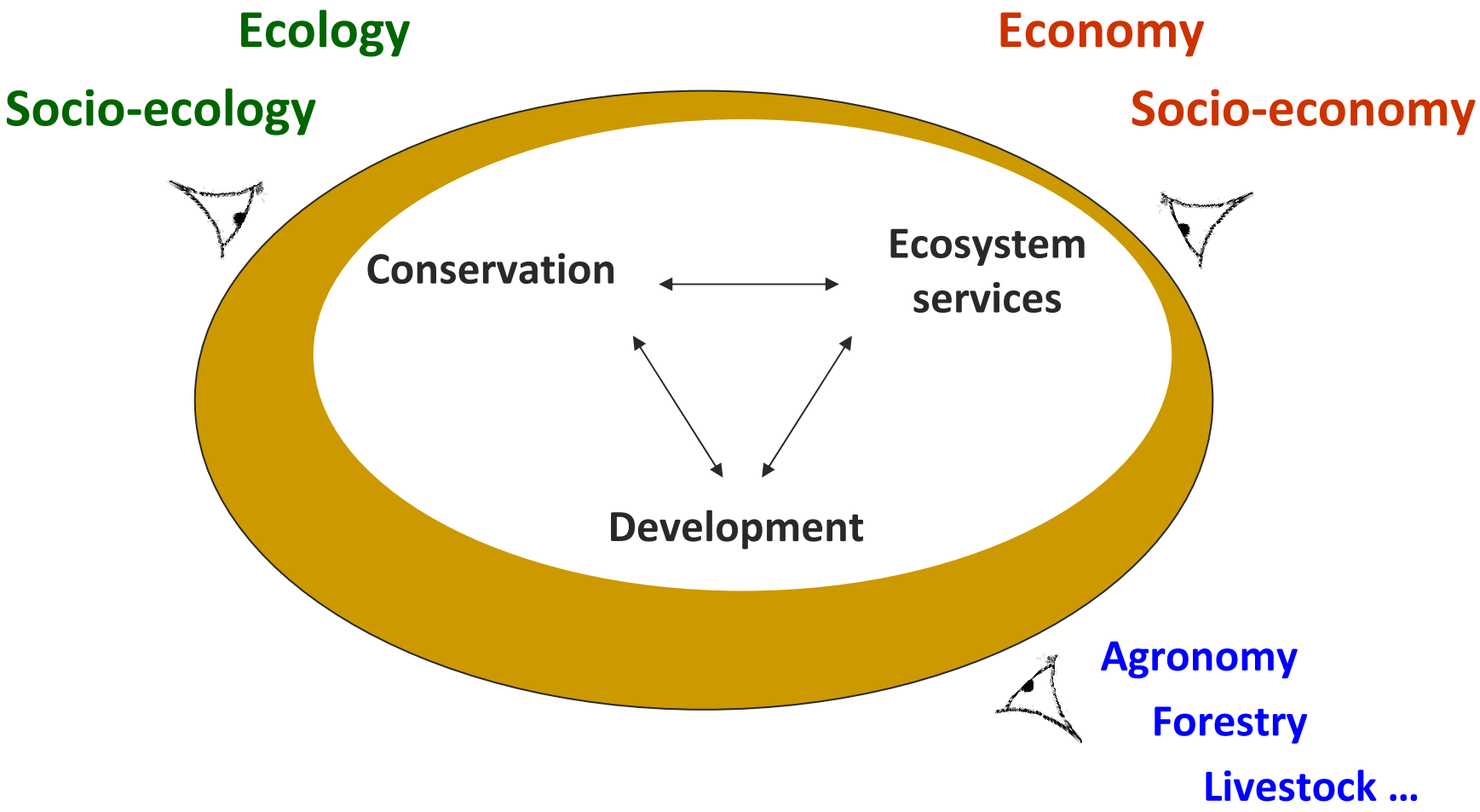
Socio - agro-ecosystem

Conservation

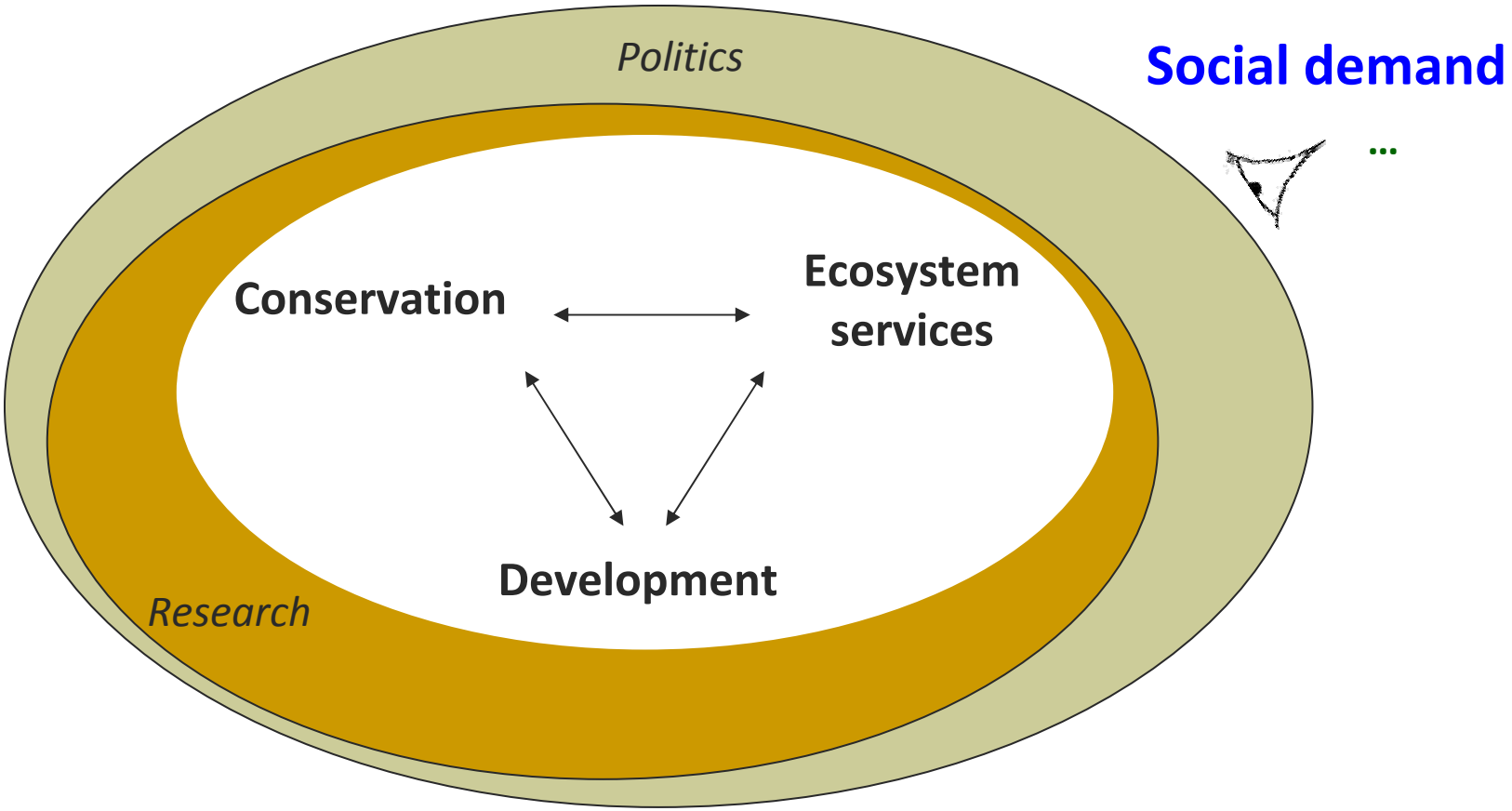
Development

Ecosystem services

Research


Ecology
Socio-ecology
Economy
Socio-economy
Conservation
Ecosystem services
Development
Agronomy
Forestry
Livestock …

Politics


Politics
Social demand
...
Conservation
Ecosystem services
Development
Research

Ecosystem services (the Benefits People Derive from Ecosystems)

PROVISIONING SERVICES

Products obtained from ecosystems

Food
Fiber
Genetic resources
Fresh water
Fuel wood
Biochemical

REGULATING SERVICES

Benefits obtained from regulation of ecosystem processes

Climate regulation
Disease regulation
Water regulation
Water purification

CULTURAL SERVICES

Nonmaterial benefits obtained from ecosystems

Spiritual and religious
Recreation and ecotourism
Aesthetic
Inspirational
Educational
Sense of place
Cultural heritage

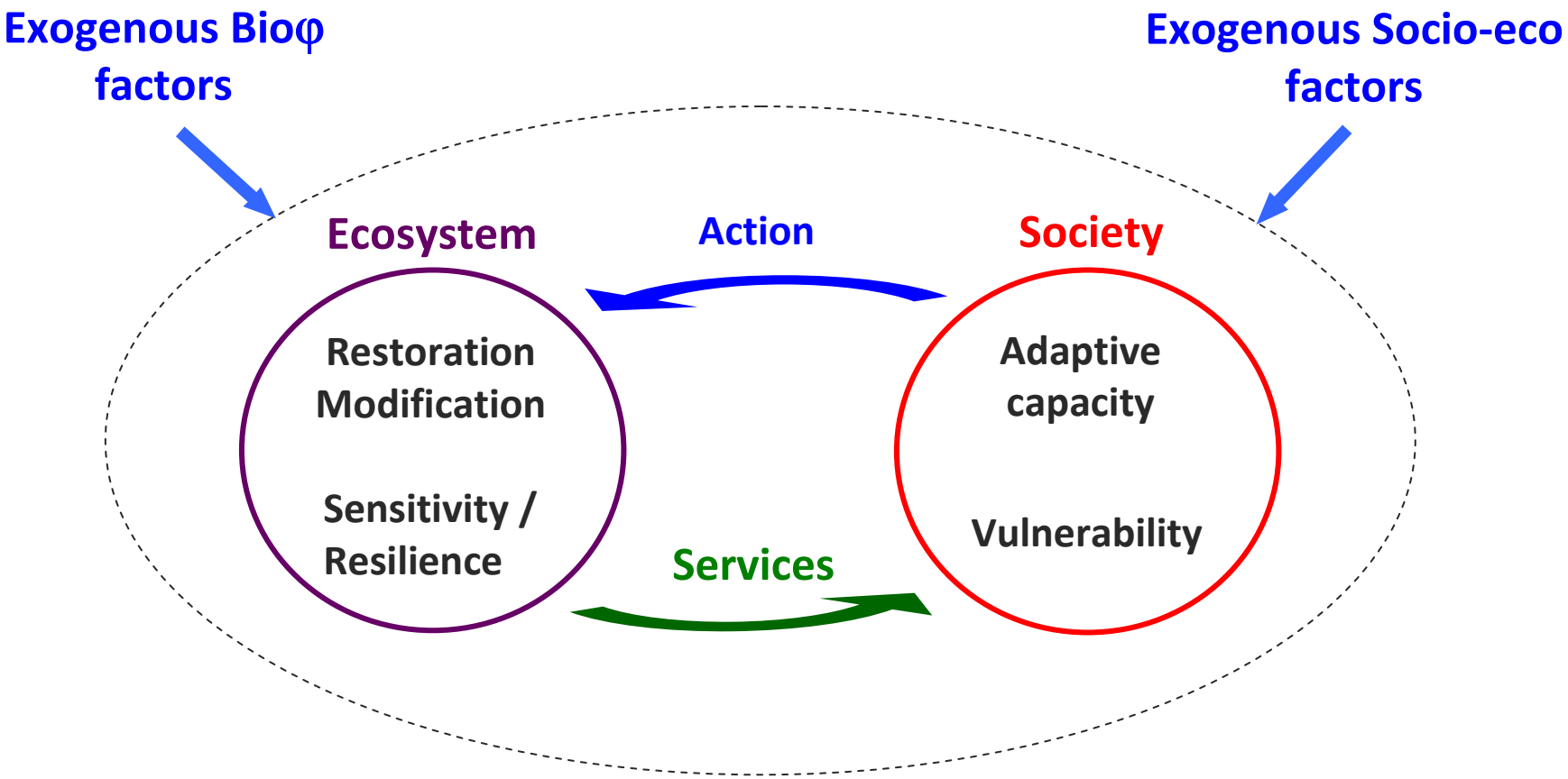
SUPPORTING SERVICES

Services necessary for the production of all other ecosystem services

Soil formation
Nutrient cycling
Primary production

Source: (Millenium Assessment, 2003)

The socio-ecosystem…



Inspired by : Locatelli et al., 2008 ; Résilience-alliance.org

Conservation (agro-biodiversity)…

Current priorities (ecoSERVICES Group Arizona State University)

High: Protected natural/wild-land area

- Reflects high international value of species threatened by extinction

Moderate: Agricultural production systems

- Direct use value from ecosystem goods and services
  Option value for the future, e.g., gene banks

Low: Agricultural landscapes

- Complex mosaic of ecosystems and biota:
  How do they interact?
- Human induced environmental change:
  Does a biodiverse landscape provide resilience and risk mitigation?

Source : Charles Perrings – ecoSERVICES Group, Arizona State University

The regulating services …

Spatially distributed agricultural externalities

Many of the most important off-site externalities relate to the regulating services:

- Water quality and quantity
- Soil erosion
- Pest predation
- Disease transmission
- Reduction of vulnerability to invasive species
- Biocorridor provision (metacommunities risk mitigation)

Source : Charles Perrings – ecoSERVICES Group, Arizona State University

Development …

3 components :

Hyden et al. (1993)

Intensification

Specialized low diversity model

(Geertz, 1963)

Highly diversified model / land pressure

Ruthenberg, 1976;
Conelly and Chaiken, 2000)

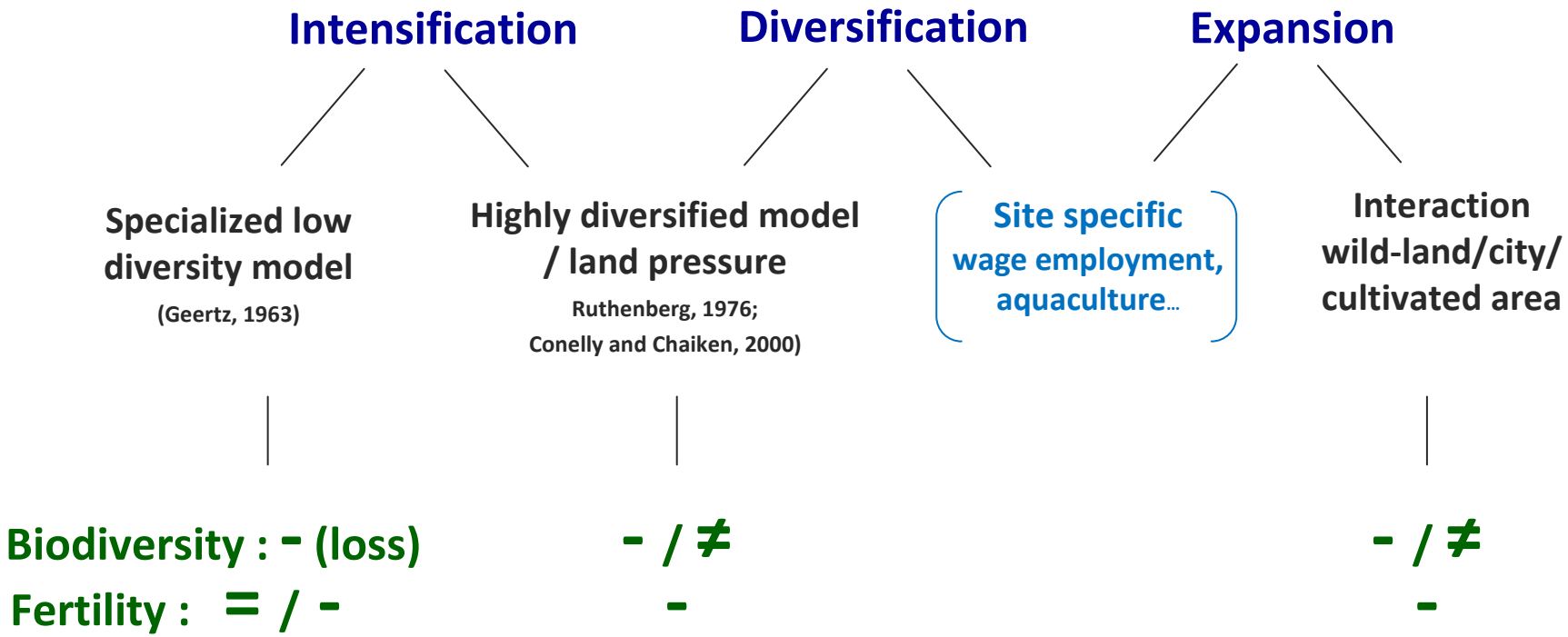
Diversification

Site specific
wage employment, aquaculture…

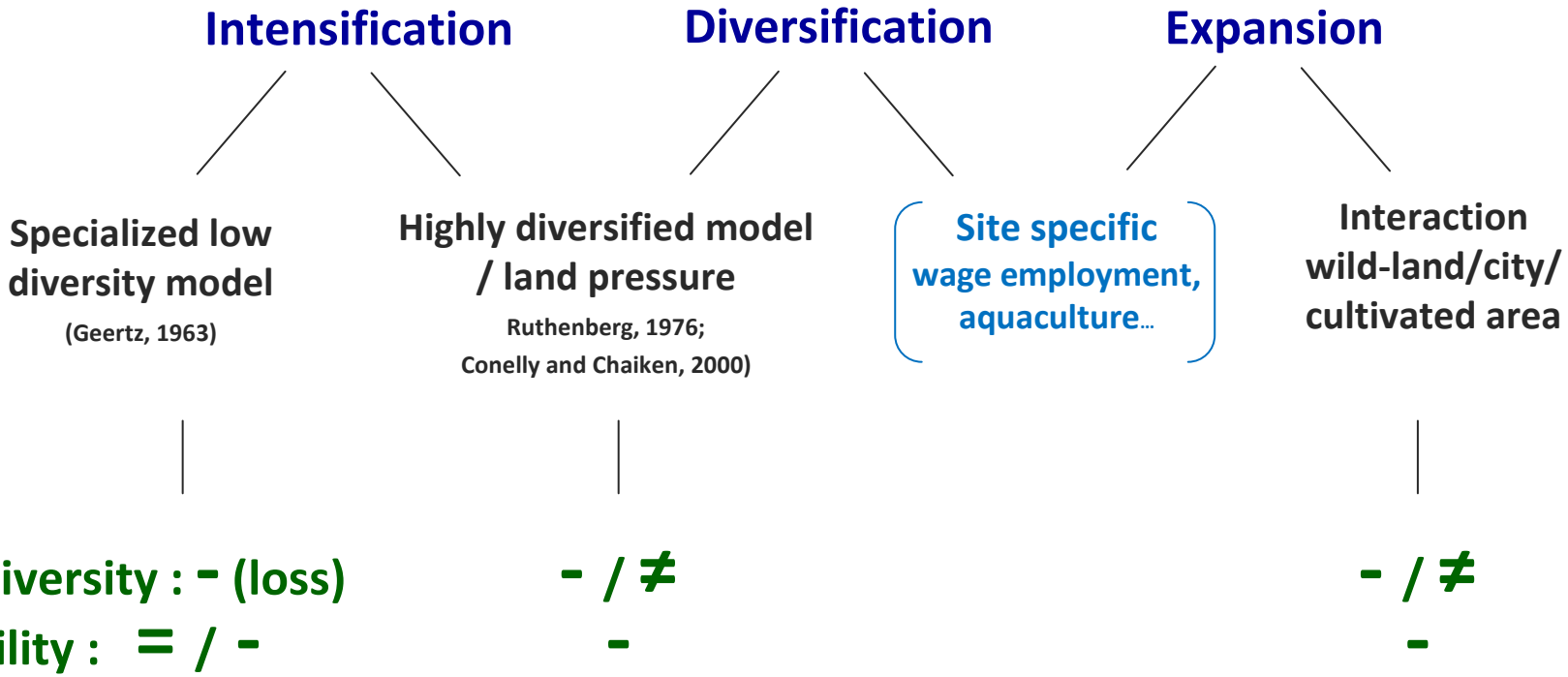
Expansion

Interaction wild-land/city/ cultivated area

Development …

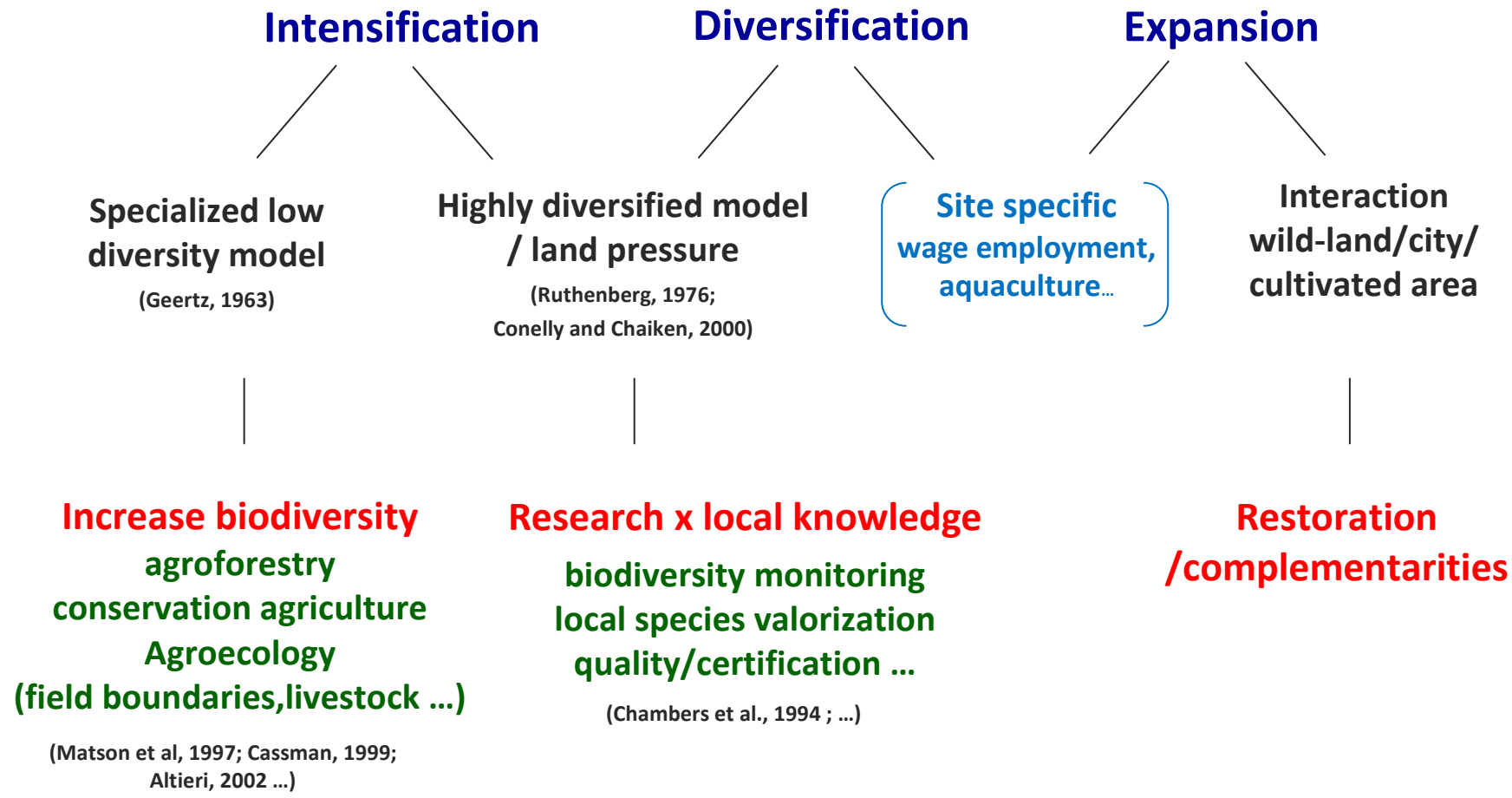


Development …



Ways to sustainability?

Development …



The platform : what proposal ?

Regulation services

Water
Soil erosion
Pest & disease
Disease transmission
Invasive species

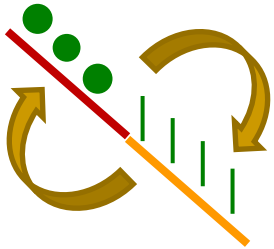
The main driver

From off-site (externalities) to be part of the socio - ecosystem

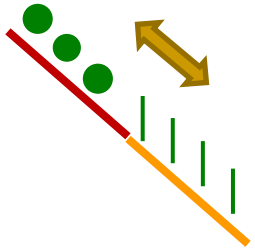
=> local management / collective action

The platform : what proposal ?

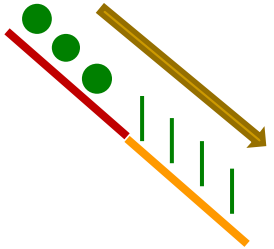
The biophysical mechanisms …



Interaction
(pest…)



Interface
(tea-coffee limits ..)



Transfer
(water, nutrients ...)

East Africa : High diversity of agro-ecosystems and landscapes in relation to both topography and population (ethnic group, history …)

=> high heterogeneity of ecosystems at the local scale level (field ⊂ farm ⊂ landscape)
appropriate support for studies

The platform : what proposal ?

Hypothesis

Up-scaling consideration (field – farm to landscape) may allow improving productivity and adaptation to change (climate, market, social…)

Questions

Theoretical

What role of the heterogeneity on the overall system properties ? (ex. GMO/résistance)

What operational boundaries for the socio-ecosystem ?

What governance ?

Applied

What adaptability and adaptation of socio-ecosystems vs. site / global environment?

What mechanisms of regulation and trade-offs biophysical / social / economic …

=> Adaptability, Adaptation, Regulation, and Trade-offs

Thème 1 : Savoirs

Leader :

Pierre Martin / UPR Système de cultures annuelles -

Réseau CIRAD : URSCA / régulation bio-agresseurs (Delphine Birman); UMR INNOVATION / processus innovation (Bernard Triomphe, Santiago Lopez Ridaura).

Partenaires : IRD-CNRS / changement climatique local (David Williamson); IFRA-U. Bordeaux III / sociétés (Bernard Callas) ; World Agroforestry Center / fertilité des sols (Edmundo Barrios); PROLINOVA - WORLD NEIGHBORS / capacity building; RUFORUM / education in agriculture (Washington O. Ochola); UMR LIRMM / gestion des connaissances (Marianne Huchard) …

Pays : Kenya, Ouganda, Tanzanie …

Thème 2 : Mécanismes

Leader :

Fabrice Pinard / UPR bioagresseur de pérennes

Réseau CIRAD : UMR BGPI / virus (Marie Line Caruana); UMR contrôle des maladies / epidémiologie spatiale (Hélène Guis); UPR AGRIS / santé animale (Eric Etter), …
URSCA / insectes (Pierre Silvie, Valérie Lemesle); UPR HORTSYS / insectes vs. systèmes haute valeur ajoutée (Alain ratnadas), …
UMR Eco&sols / Production I, cycle C (Philippe Vaast, …), …

Partenaires : Coffee R. Foundation / environnement & qualité, ICIPE / controle bioagresseurs, KARI / filères horticole et fleurs, …

Pays : Kenya, …

Thème 3 : Organisation du paysage

Leader :

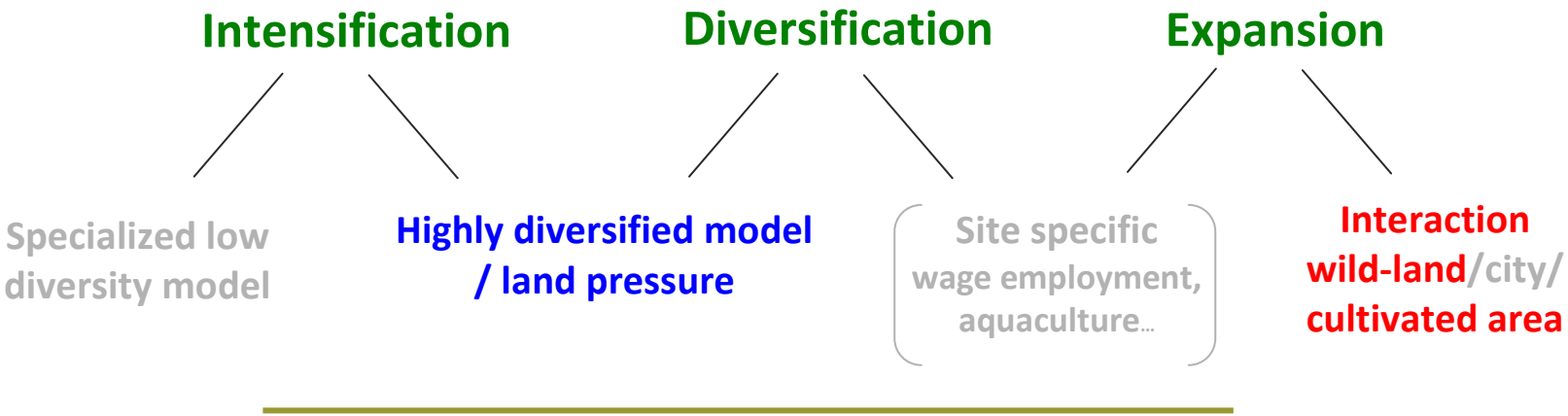
Philippe Vaast / UPR écosystèmes de plantations

Réseau CIRAD : URSCA nouvelle recrue?; URSCA Réunion + eRcane / upscaling; UMR DAP / Spatialisation variétés Sorgho (Caroline MWONGERA, Christian LECLERC); UPR HORTSYS / systèmes haute valeur ajoutée, évaluation & ACV (Thibaud Martin), …

Partenaires : World Agroforestry Center / economics vs. ecosystem services & resource management (Steven C. Franzel, Joseph Tanui); KESREF / plurifonctionnalité canne à sucre (Betty Mulianga); International Institute of Tropical Agriculture / systèmes banane-café (Piet van Asten); …

Pays : Kenya, Uganda, Burundi, Rwanda, Tanzania …

Link with other regional PCP ?



PCP (Afrique de l'Est)

RP-PCP (Zimbabwe)

What role of the heterogeneity on the overall system properties ?

PP&G (Afrique du Sud)
Gouvenance